A RETAINING MEMBER

The invention relates to a retaining member of a plastic material which is useful for holding lines on a support.

When pipes, flexible tubes, and other lines through which pressure pulses are transmitted are mounted on a support by means of retaining members it is desirable to isolate the pressure pulses from the support. For example, this problem occurs in mounting brake lines on the body-in-white sheets of motor vehicles. Here, the transmission of pressure surges can cause vibrations in the audible range which can even be intensified by resonant bodies existing in the motor vehicle. Avoiding the transmission of the pressure surges onto the support from the lines is also called "acoustic isolation" in this application.

DE 40 34 545 A1 has made known a two-piece retaining member of a plastic for holding at least one tubular component that has an outer cup of a hard material mountable on a support via a retaining area and an inner cup of a soft material inserted therein which has at least one bearing point to receive the tubular component. To prevent the transmission of vibrations onto a support via the tubular component, the inner cup is mounted on the outer cup via an anchoring device on either side of the bearing point and a continuous clearance exists between the inner cup and the outer cup in the area of the bearing point.

EP 0 483 636 B1 has made known a retaining member of a plastic which has at least one bearing area disposed next to a retaining area for receiving at least one tubular component. To prevent the transmission of vibrations of a tubular component onto a support, the retaining member is of a three-piece design including a first part of hard material which exhibits the bearing area, a second part of a soft, damping material which is embedded therein, and a third part of a hard material which is embedded therein via a through hole and exhibits the retaining area.

The known retaining members still leave a great deal to be desired with regard to the isolation of the pressure surges transmitted from the support via the lines.

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Accordingly, it is the object of the invention to provide a retaining element of a plastic which enables the pressure surges transmitted via the lines to be isolated better from the support.

The object is achieved by a retaining element having the features of claim 1. Advantageous aspects of the retaining element are indicated in the dependent claims.

The inventive retaining element of a plastic, which is useful for holding at least one line on a support, has

- a basic body with a mounting area for mounting on the support and a retaining area projecting from at least one side of the mounting area with at least one line seating for at least one line, and
- a resilient contact area projecting from the side of the mounting area that requires to be placed on the support.

When the inventive retaining member is mounted on a support the resilient contact are will spring in more or less. On the side of the retaining member that faces the support, the contact between the retaining member und the support is concentrated onto the contact area. As distinguished from the basic body, the contact area is designed as being resilient or more intensely resilient. Hence, the contact area exhibits a lower spring constant than does the basic body. Retaining members having a virtually rigid basic body are also incorporated. The resilient contact area significantly reduces the transmission of pressure surges onto the support. Moreover, the contact area maintains the retaining area at a distance from the support. The reduction of pressure surges is favoured by the relatively low spring constant of the contact area. Summarizing, the inventive retaining member considerably improves the acoustic isolation of the lines from the support.

The retaining member can be mounted on the support in different configurations. In an aspect, the mounting area has a seating oriented transversely to the contact area for a mounting pin or rivet and/or a mounting pin or rivet oriented transversely to the contact area. For example, the mounting area can have a seating

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for a welding bolt which is welded to the support. However, a mounting bolt or rivet can also be inserted or have been inserted into the seating for connection to the support. In addition, the mounting area can be fixedly joined to a mounting pin or rivet which is connectable to the support.

In an aspect, the seating has inwardly projecting lamellae of the basic body which serve for anchoring to a mounting pin or rivet.

In an aspect, the mounting area has a box-shaped or cage-shaped or cylindrical or block-shaped body. This is the way a body having a seating or a body having an integrally joined mounting pin or rivet can be designed with advantage.

In an aspect, retaining areas project from the two sides of the mounting area. This allows to mount the retaining member on the support in a more or less central location. The self-centering action of the mounting area (e.g. on the pin or rivet), the approximately rectangular orientation of the mounting area to the support, and the compensation of the forces acting onto two retaining areas by the lines distributed to either side favour the supporting action of the retaining member, primarily via the central contact area on the support.

In an aspect, each retaining area has a flat retaining arm and at least one clipping element disposed on a flat side of the retaining arm with a line seating.

In an aspect, the retaining arm is hollow in part.

In an aspect, the retaining area, on the side facing the support, has an increasing distance from the level of the side of the mounting area that requires to be placed on the support with an increasing distance from the mounting area.

The acoustic isolation is favoured by an extension as short as possible of the contact area in the direction of the retaining area. In an aspect, the contact area is disposed on a transverse central plane via a seating and/or a mounting pin or rivet. In an aspect, the contact area has contact elements on diametrically opposed sides of a seating and/or a mounting pin or rivet. In an aspect, the contact elements are two ribs extended in the direction of the retaining areas. In an aspect, the overhang of the

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contact area beyond the side of the mounting area that requires to be placed on the support decreases towards the retaining area. In an aspect, the contact area is of a cambered design.

In an aspect, the mounting area, on the side that requires to be placed on the support, has at least one rigid protrusion (if possible, about the central axis of a seating and/or a mounting pin or rivet having a small extension to the retaining areas) beyond which projects the contact area projects. When the non-rigid contact area undergoes heavy compression the rigid protrusion comes to bear thereon. In addition, the rigid protrusion provides for a contact located around the mounting centre even if the non-rigid contact area is completely compressed.

In an aspect, the protrusion is of a ring shape. The ring-shaped protrusion can extend around a seating and/or a mounting pin or rivet.

In an aspect, the overhang of the protrusion beyond the side of the mounting area that requires to be placed on the support decreases in the direction in which the retaining area extends.

Basically, the basic body and the contact are can be made of the same plastic material where an appropriate configuration can help in giving the basic body a higher spring constant and the contact area a lower spring constant. In an aspect, the rigid basic body is made of a rigid plastic material and/or the resilient contact area is made of a non-rigid plastic material or a rigid plastic material having a non-rigid nature. The different spring constants will then be caused by the plastic materials.

In an aspect, the line seating is formed in a substantially cylindrical, elastically expandable cup having an insertion slot. The cup is a clamping member into which the line can be snapped simply through the insertion slot. In an aspect, at least some part of the line seating has a lining made of a non-rigid plastic material. This helps achieve a further improvement to the acoustic isolation of the line from the support.

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In an aspect, the linings of various line seatings and/or at least the lining of a line seating and the contact area are connected to each other via a duct filled with the non-rigid plastic material. The non-rigid plastic material can be fed via an injection point.

In an aspect, the contact area and/or the linings is/are manufactured from a thermoplastic elastomer. Thermoplastic elastomers allow for a low spring constant of the contact area and/or linings (low friction/low surface load of the contact areas (in case of compressed constructional space).

The invention will be described in more detail below with reference to the accompanying drawings of an embodiment. In the drawings:

Fig. 1 shows the retaining member in a perspective view oblique to the side to be placed against the support;

Fig. 2 shows the same retaining member in a perspective view oblique to the opposite side;

Fig. 3 shows the same retaining member in a side view prior to being positioned on a welding bolt;

Fig. 4 shows the same retaining member while being positioned on a welding bolt in the same view;

Fig. 5 shows the same retaining member in one of the final mounting positions on the welding bolt in the same view.

The inventive retaining member 1 has a basic body 2 of a rigid plastic material. For example, this is a PA (e.g. PA 6.6 or PA 6).

The basic body 2 comprises a central mounting area 3 which is formed in a box shape or cage shape. A seating 4 for mounting bolt is located in the mounting area 3. The seating 4 is accessible through a hole 5 in that side of the mounting area 3 which faces the support. The seating 4 has disposed therein two groups of parallel lamellae 6 which are on two opposed sides and are inclined towards the hole 5 on either side.

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Retaining areas 7, 8 extend away from two opposed sides of the mounting area 3. The areas comprise an approximately plate-shaped retaining arm 9, 10 each which, starting from the two narrow sides, exhibit pocket-shaped cavities 11, 12, 13, 14. The retaining arms 9, 10 extend from the level of that side of of the mounting area 3 which is to be placed against the support.

The arms each carry two two clamping members 15 to 18 on the side to be faced away from the support. The members are designed as elastically expandable cups having an insertion slot 19 to 22 each. They house a line seating 23 to 26 each. The seating is confined by an additional clamping tongue 27 in the clamping member 18.

Finally, at the side to be placed against the support, the mounting area 3 has a ring-shaped protrusion 28, which extends around the hole 5.

The aforementioned components of the retaining member 1 are made of a rigid plastic material. They may be advantageously injection-moulded in a single operation.

The clamping members 15 to 17 have linings 29 to 31 of a non-rigid plastic material. The linings 29 to 31 have ribs 32 to 34 which project each from their insides. The ribs extend in parallel with the insertion slots 19 to 21 and, hence, in parallel with the lines to be inserted. Several of them are disposed in sets over the inner circumference of the clamping members 15 to 17. The clamping member 18 has no lining.

On diametrically opposed sides of the hole 5 and outside the ring-shaped protrusion 28, the mounting area 3 carries rib-shaped contact members 36, 37 on the side to be faced to the support. They extend slightly towards the two retaining arms 9, 10. They project at an overhang father beyond the side to be faced to the support than does the ring-shaped projection 28. They are of a cambered design with their apex being approximately in the transverse central plane of the hole 5 and the

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overhang decreasing towards the retaining arms 9, 10. They together define a contact area 36, 37.

Two ducts 38 to 41 are located on the two outer surfaces of the basic body between the contact members 36, 37 and the linings 29, 31. Furthermore, the linings 29 and 30 are interconnected by channels 42, 43 in the sides of of the basic body 2. The linings 29, 31 and the contact members 36, 37 are made of the same non-rigid plastic material. The channels 38 to 43 are also filled with this plastic material. Thus, all of the non-rigid components of the retaining member 1 can be injection-moulded in a single step.

The whole of the retaining member 1 can be injection-moulded only in two steps in one or two injection moulding tools.

The assembly and function of the retaining member 1 will be described below:

According to Fig. 3, the retaining member 1 aligns the hole 5 onto a welding bolt 44 which is welded perpendicularly onto a sheet-like support 45.

According to Fig. 4, the retaining member 1 is pushed onto the welding bolt 44. As a result, the lamellae 6 will be slightly bent apart.

According to Fig. 5, the retaining member 1 has seated its contact elements 36, 37 on the support 45 at the end of assembly. The contact elements 36, 37 are slightly compressed. The ring-shaped projection 28 is at a distance from the support 45. The retaining arms 9, 10 are at an even larger distance. The lamellae 6 prevent the retaining member 1 from slipping back from the welding bolt 44 and fix the retaining member at a firmly defined rerention force, in a cooperation with a contoured area (e.g. a thread profile) on the welding bolt 44.

Lines oriented perpendicularly to the plane of the drawing are pushed into the clamping members 15 to 18 through the insertion slots 19 to 22. The clamping members 15 to 18 receive lines through which pressure surges are transmitted. The

clamping member 18 is destined for the reception of a line through which no pressure surges pass.

The pressure surges are attenuated by the non-rigid linings 29 to 31. This achieves an acoustic isolation of the lines from the support 45 that has not been attained hitherto.